

features

- 5-Pin SC-70 (SOT-323) Package
- Supply Current of 9 μ A (Typ)
- Power-On Reset Generator With Fixed Delay Time
 - TPS3800 = 100 ms
 - TPS3801 = 200 ms
 - TPS3802 = 400 ms
- Precision Supply Voltage Monitor 1.8 V, 2.5 V, 2.7 V, 3 V, 3.3 V, 5 V, and Adjustable
- Manual Reset Input (Except TPS3801–01)
- Temperature Range . . . -40°C to 85°C

description

The TPS380x family of supervisory circuits provide circuit initialization and timing supervision, primarily for DSPs and processor-based systems.

During power-on, $\overline{\text{RESET}}$ is asserted when the supply voltage V_{DD} becomes higher than 1.1 V. Thereafter, the supervisory circuit monitors V_{DD} (or SENSE) and keeps $\overline{\text{RESET}}$ active as long as V_{DD} (or SENSE) remains below the threshold voltage (V_{IT}). An internal timer delays the return of the output to the inactive state (high) to ensure proper system reset. The delay time (t_d) starts after V_{DD} (or SENSE) has risen above the threshold voltage (V_{IT}). When the supply voltage drops below the threshold voltage (V_{IT}) the output becomes active (low) again. No external components are required. All the devices of this family have a fixed sense-threshold voltage (V_{IT}) set by an internal voltage divider, except for the TPS3801–01, which can be customized with two external resistors at the SENSE input.

The TPS380x devices, except the TPS3801–01, incorporate a manual reset input ($\overline{\text{MR}}$). A low level at $\overline{\text{MR}}$ causes $\overline{\text{RESET}}$ to become active.

The product spectrum is designed for supply voltages of 1.8 V, 2.5 V, 2.7 V, 3 V, 3.3 V, and 5 V. The circuits are available in a 5-pin SC-70 (SOT-323) package, which is only about half the size of a 5-pin SOT-23 package.

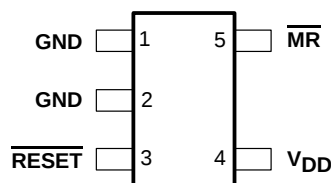
The TPS3801–01 can monitor voltages as low as 1.14 V, depending on the configuration of the external resistor divider.

The TPS380x devices are characterized for operation over a temperature range of -40°C to 85°C .

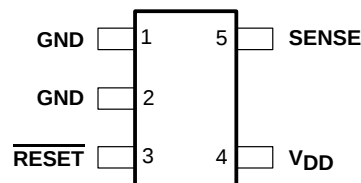
applications

- Applications Using DSPs, Microcontrollers, or Microprocessors
- Wireless Communication Systems
- Portable/Battery-Powered Equipment
- Programmable Controls
- Intelligent Instruments
- Industrial Equipment
- Notebook/Desktop Computers
- Automotive Systems

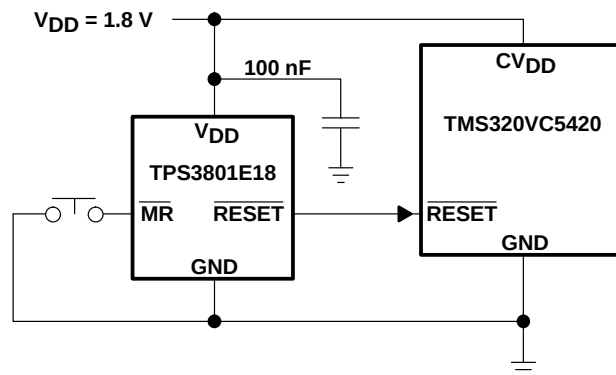
TPS380x . . . DCK PACKAGE
(TOP VIEW)



TPS3801–01 . . . DCK PACKAGE
(TOP VIEW)



typical applications



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**TEXAS
INSTRUMENTS**

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TPS3800-xx, TPS3801-xx, TPS3802-xx
ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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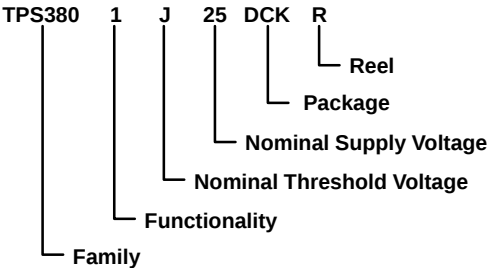
AVAILABLE OPTIONS

T _A	DEVICE NAME	THRESHOLD VOLTAGE	TYP DELAY TIME	MARKING
–40°C to 85°C	TPS3801-01DCK	1.14 V	200 ms	ARF
	TPS3801E18DCK	1.71 V	200 ms	ARE
	TPS3801J25DCK	2.25 V	200 ms	NJA
	TPS3800G27DCK	2.5 V	95 ms	ARI
	TPS3801L30DCK	2.64 V	200 ms	NPA
	TPS3801K33DCK	2.93 V	200 ms	NWA
	TPS3802L30DCK	2.64 V	380 ms	ASA
	TPS3802K33DCK	2.93 V	380 ms	ARK
	TPS3801T50DCK	4 V	25 ms	AVI
	TPS3801I50DCK	4.55 V	200 ms	NSA

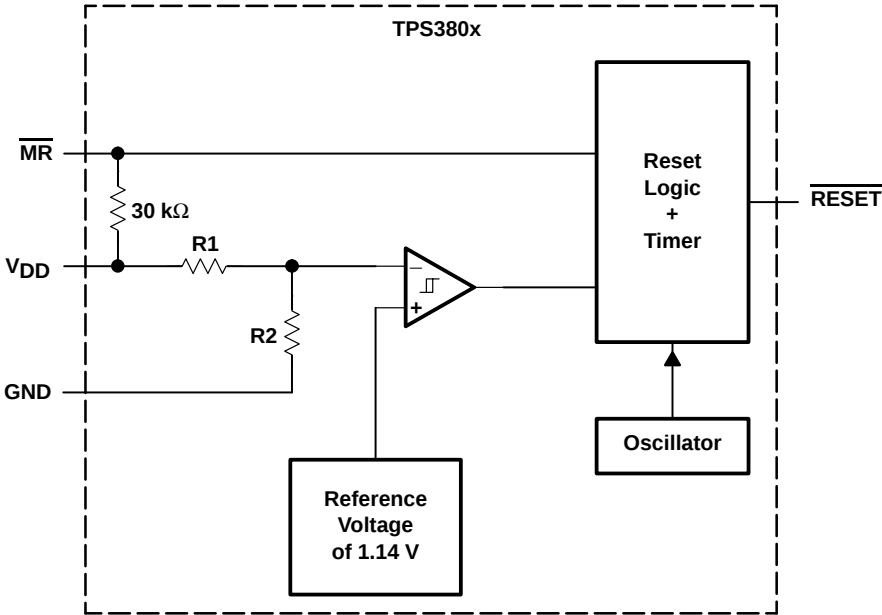
FUNCTION/TRUTH TABLE, TPS380x

$\overline{\text{MR}}$	$V_{\text{DD}} > V_{\text{IT}}$	$\overline{\text{RESET}}$
L	0	L
L	1	L
H	0	L
H	1	H

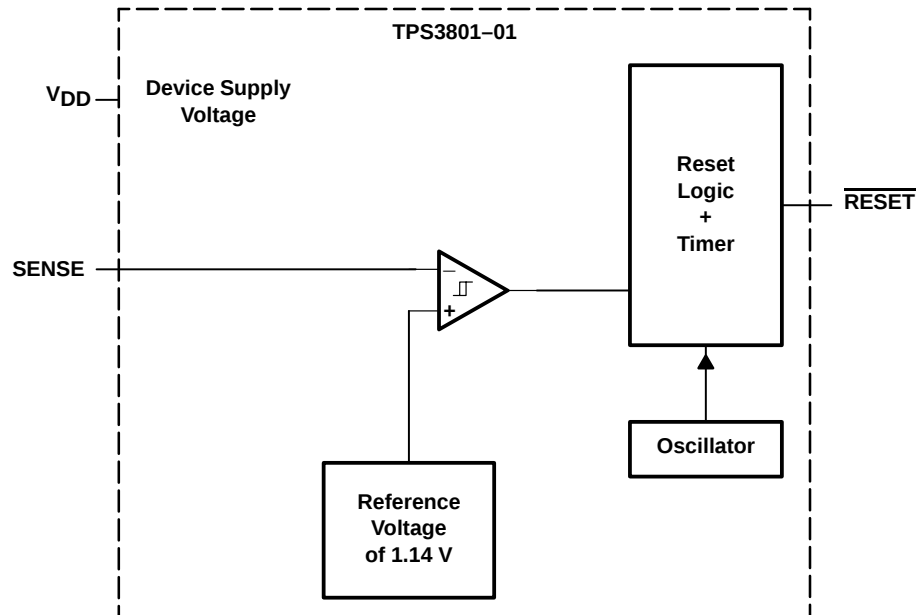
ORDERING INFORMATION



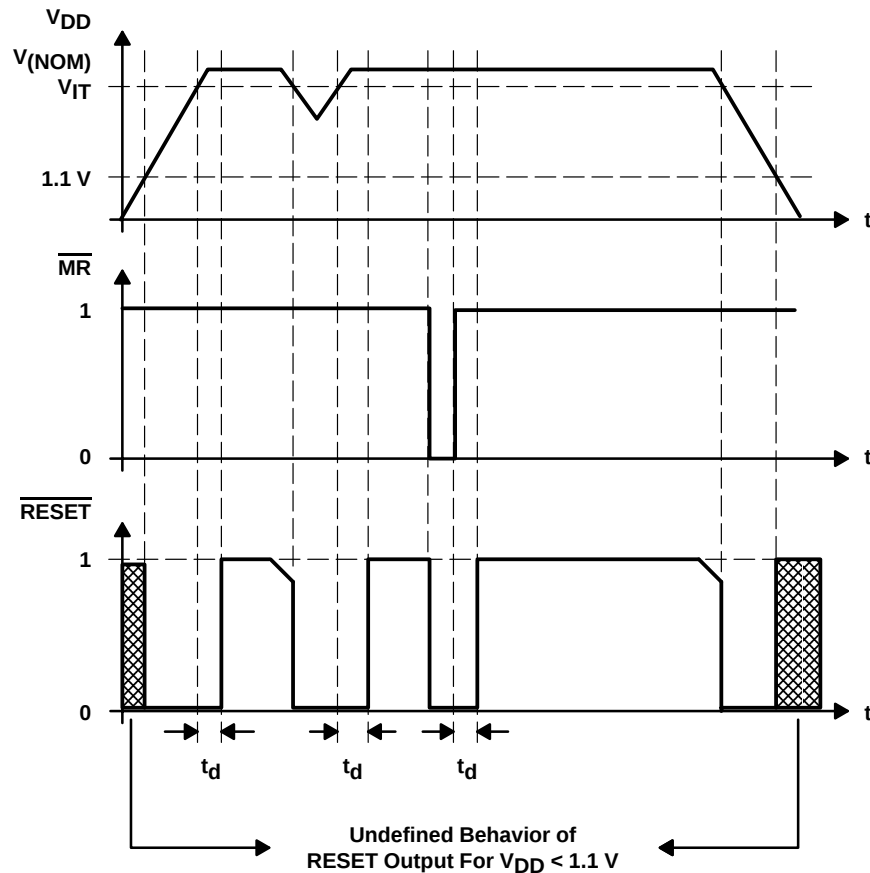
functional block diagram



functional block diagram (continued)



timing diagram



NOTE: $\overline{RESET}$ should not be forced high during the power-up sequence (until $V_{DD} > 1.1\text{ V}$).

TPS3800-xx, TPS3801-xx, TPS3802-xx ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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absolute maximum ratings over operating free-air temperature (unless otherwise noted)[†]

Supply voltage, V_{DD} (see Note1)	7 V
All other pins (see Note 1)	–0.3 V to 7 V
Maximum low-output current, I_{OL}	5 mA
Maximum high-output current, I_{OH}	–5 mA
Input-clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{DD}$)	±20 mA
Output-clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{DD}$)	±20 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	–40°C to 85°C
Storage temperature range, T_{stg}	–65°C to 150°C
Soldering temperature	260°C

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values are with respect to GND. For reliable operation, the device should not be operated at 7 V for more than $t=1000h$ continuously.

DISSIPATION RATING TABLE

PACKAGE	$T_A < 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
DCK	321 mW	2.6 mW/°C	206 mW	167 mW

recommended operating conditions at specified temperature range

		MIN	MAX	UNIT
Supply voltage, V_{DD}	TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, TPS3801T50	2	6	V
	All other devices	1.6	4	V
Input voltage, V_I		0	$V_{DD}+0.3$	V
High-level input voltage, V_{IH}		$0.7 \times V_{DD}$		V
Low-level input voltage, V_{IL}			$0.3 \times V_{DD}$	V
Input transition rise and fall rate at $\overline{MR}$, $\Delta t/\Delta V$			100	ns/V
Operating free-air temperature range, T_A		–40	85	°C



TPS3800-xx, TPS3801-xx, TPS3802-xx ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V _{OH}	High-level output voltage	V _{DD} = 1.6 V to 6 V I _{OH} = −500 μA		V _{DD} −0.2			V
		V _{DD} = 3.3 V I _{OH} = −2 mA		V _{DD} −0.4			
		V _{DD} = 6 V I _{OH} = −4 mA (see Note 4)		V _{DD} −0.4			
V _{OL}	Low-level output voltage	V _{DD} = 1.6 V to 6 V, I _{OL} = 500 μA		0.2			V
		V _{DD} = 3.3 V, I _{OL} = 2 mA		0.4			
		V _{DD} = 6 V, I _{OL} = 4 mA (see Note 4)		0.4			
Power-up reset voltage (see Note 2)		V _{DD} ≥ 1.1 V, I _{OL} = 50 μA		0.2			V
V _{IT−}	Negative-going input threshold voltage (see Note 3)	TPS380x-01	T _A = −40°C to 85°C	1.117 1.14 1.163			V
		TPS380xE18		1.67 1.71 1.75			
		TPS380xJ25		2.2 2.25 2.3			
		TPS380xG27		2.45 2.5 2.55			
		TPS380xL30		2.58 2.64 2.7			
		TPS380xK33		2.87 2.93 2.99			
		TPS380xI50		4.45 4.55 4.65			
		TPS380xT50		3.92 4 4.08			
V _{hys}	Hysteresis	TPS380x-01		15			mV
		TPS380xx18		25			
		TPS380xx25		30			
		TPS380xx27		35			
		TPS380xx30		35			
		TPS380xx33		40			
		TPS380xx50		60			
I _{IH}	High-level input current	$\overline{\text{MR}}$	$\overline{\text{MR}}$ = 0.7×V _{DD} , V _{DD} = 6 V	−40	−60	−100	μA
I _{IL}	Low-level input current		$\overline{\text{MR}}$ = 0 V, V _{DD} = 6 V	−130	−200	−340	
I _I	Input current	SENSE		−25		25	nA
I _{DD}	Supply current	TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, TPS3801T50	V _{DD} = 2 V, $\overline{\text{MR}}$ and output unconnected	9 12			μA
		TPS3801I50, TPS3801T50	V _{DD} = 6 V, $\overline{\text{MR}}$ and output unconnected	20 25			
		TPS3801-01	V _{DD} = 1.6 V, SENSE = 0 V to V _{DD} , output unconnected	7 10			
			V _{DD} = 4 V, SENSE = 0 V to V _{DD} , output unconnected	9 12			
		TPS3801E18, TPS3800G27, TPS3802K33, TPS3802L30	V _{DD} = 1.6 V, $\overline{\text{MR}}$ and output unconnected	8 11			
			V _{DD} = 4 V, $\overline{\text{MR}}$ and output unconnected	13 18			
C _i	Input capacitance	V _I = 0 V to V _{DD}		5			pF

NOTES: 2. The lowest supply voltage at which RESET becomes active. t_r , $V_{DD} \geq 15\text{ }\mu\text{s/V}$.
3. To ensure the best stability of the threshold voltage, a bypass capacitor (0.1- μF ceramic) should be placed near the supply terminals.
4. Only valid for the TPS3801J25, TPS3801L30, TPS3801K33, TPS3801I50, and TPS3801T50.



TPS3800-xx, TPS3801-xx, TPS3802-xx ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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timing requirements at $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_w Pulse width	at SENSE	$V_{DD} = 1.6\text{ V}$, $V_{IH} = 1.1 \times V_{IT-}$, $V_{IL} = 0.9 \times V_{IT-}$	1			μs
	at V_{DD}	$V_{DD} = V_{IT-} + 0.2\text{ V}$, $V_{DD} = V_{IT-} - 0.2\text{ V}$	3			
	at MR	$V_{DD} \geq V_{IT-} + 0.2\text{ V}$, $V_{IL} = 0.3 \times V_{DD}$, $V_{IH} = 0.7 \times V_{DD}$	100			ns

switching characteristics at $R_L = 1\text{ M}\Omega$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_d Delay time	TPS3801T50	$V_{DD} \geq V_{IT-} + 0.2\text{ V}$, $MR \geq 0.7 \times V_{DD}$ See timing diagram	15	25	35	ms
	TPS3800		60	95	140	
	TPS3801		120	200	280	
	TPS3802		240	380	560	
t_{PHL} Propagation (delay) time, high-to-low-level output	MR to RESET delay	$V_{DD} \geq V_{IT-} + 0.2\text{ V}$, $V_{IL} = 0.3 \times V_{DD}$, $V_{IH} = 0.7 \times V_{DD}$		15		ns
	V_{DD} to RESET delay	$V_{IL} = V_{IT-} - 0.2\text{ V}$, $V_{IH} = V_{IT-} + 0.2\text{ V}$		1		μs
	SENSE to RESET					

TYPICAL CHARACTERISTICS

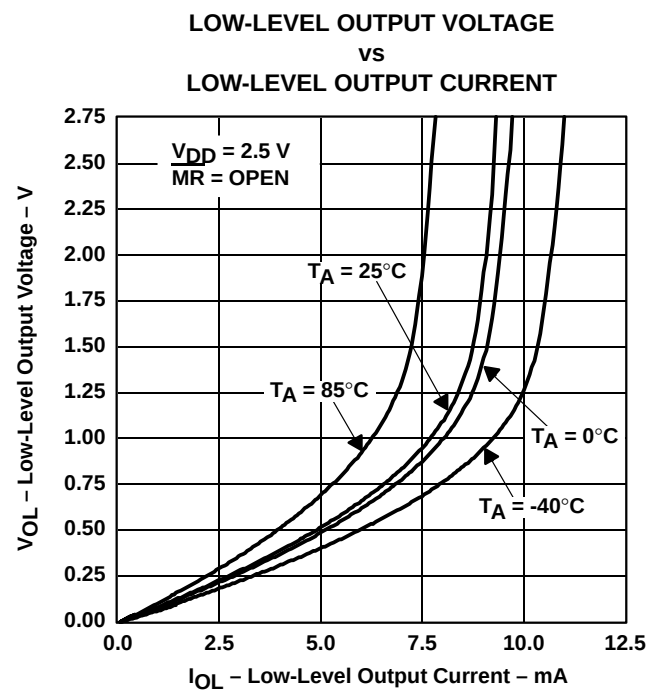


Figure 1

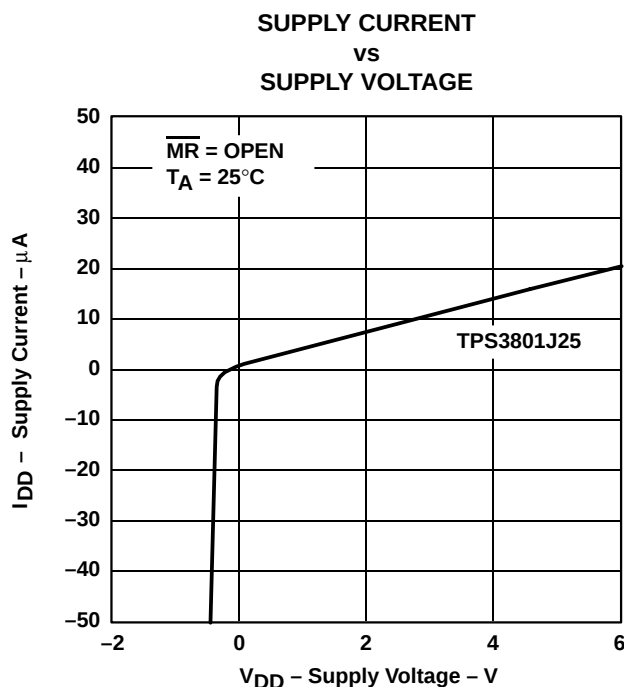


Figure 2

TYPICAL CHARACTERISTICS

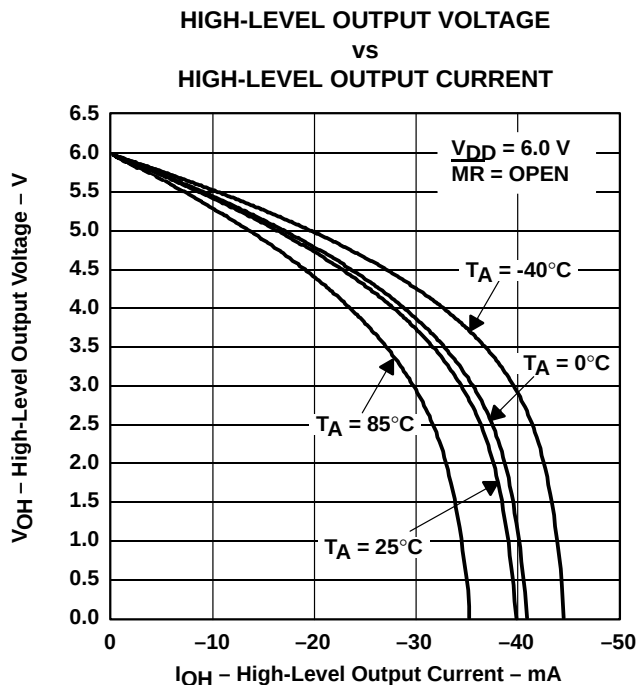


Figure 3

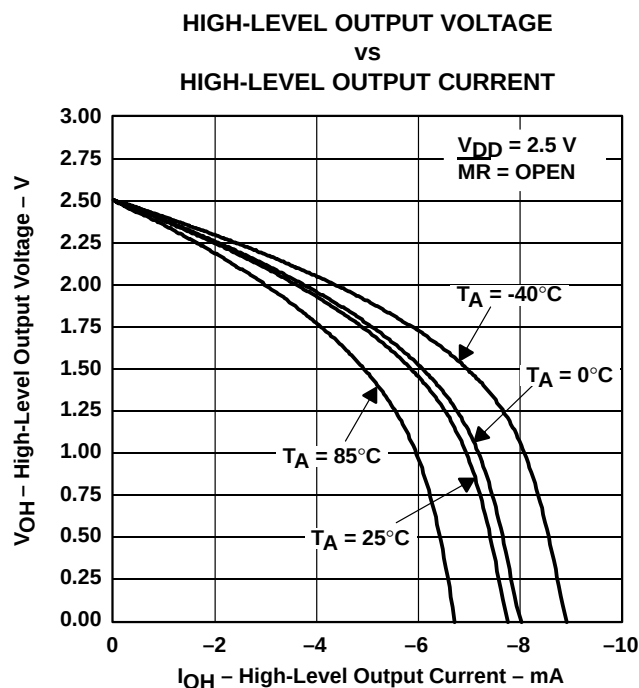


Figure 4

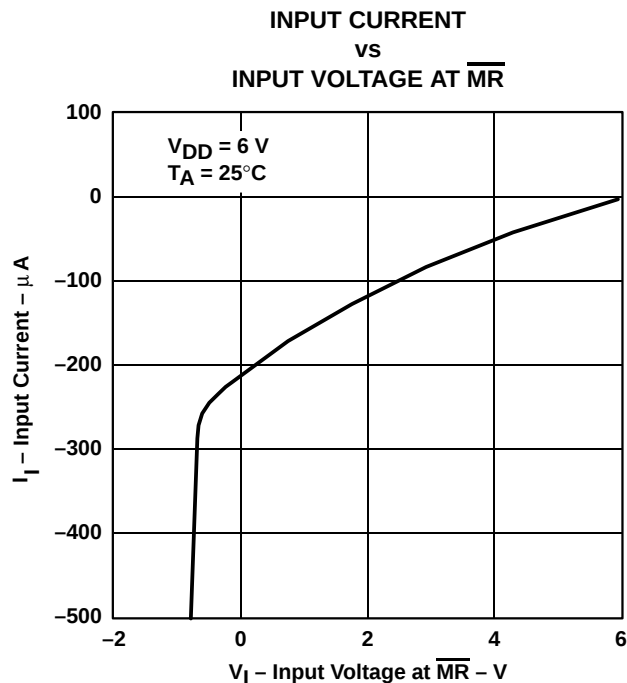


Figure 5

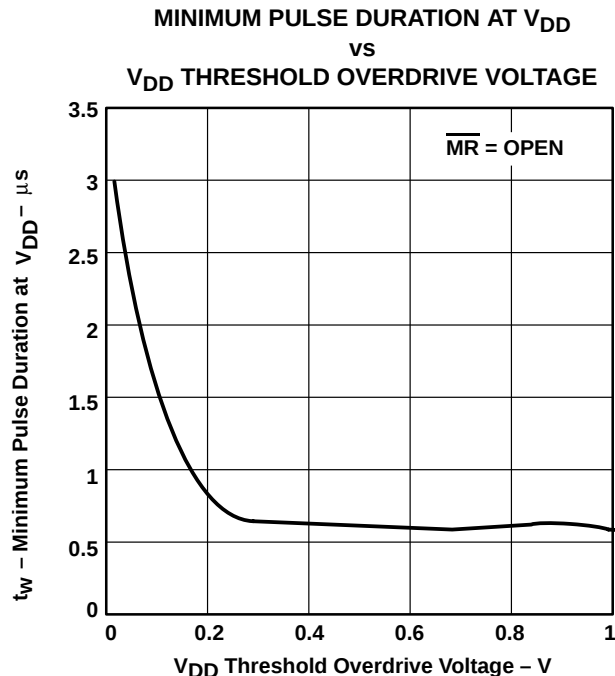


Figure 6

TPS3800-xx, TPS3801-xx, TPS3802-xx
ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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TYPICAL CHARACTERISTICS

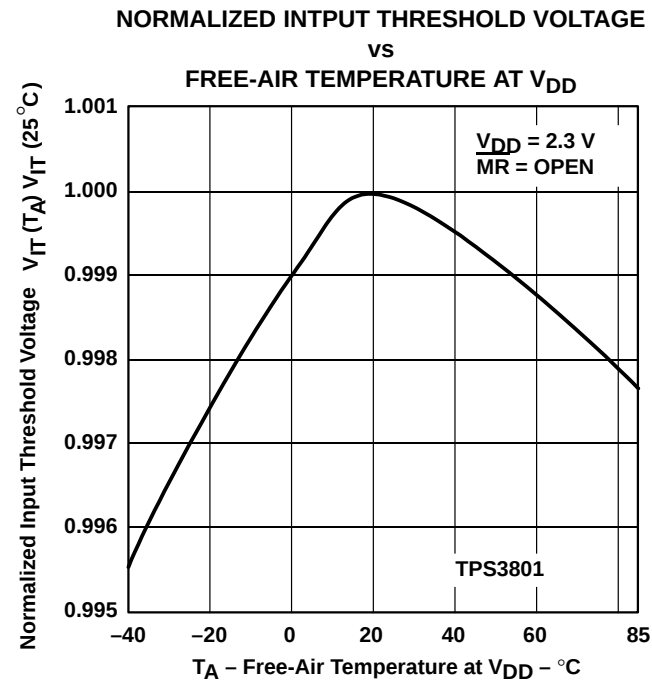


Figure 7

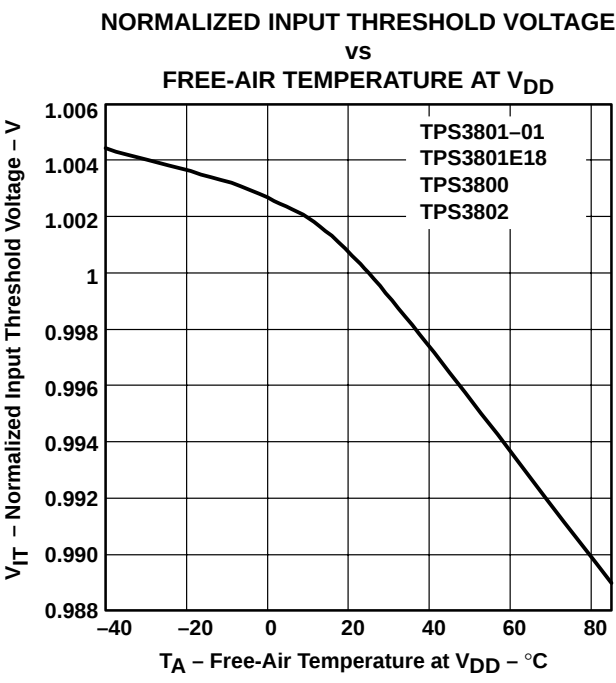


Figure 8

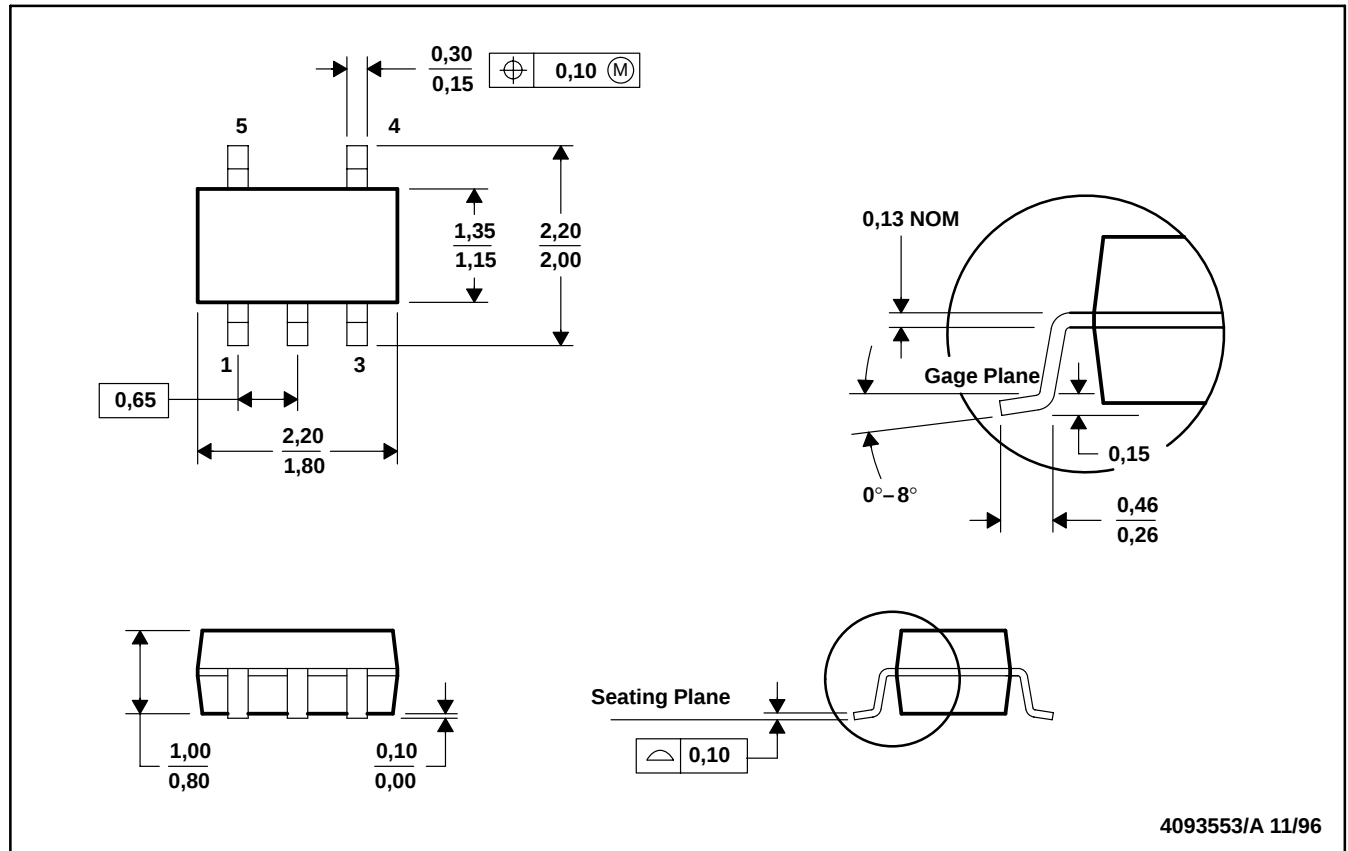
TPS3800-xx, TPS3801-xx, TPS3802-xx
ULTRA-SMALL SUPPLY VOLTAGE SUPERVISORS

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MECHANICAL DATA

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions include mold flash or protrusion.

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